United States Department of the Interior

FISH AND WILDLIFE SERVICE

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March 6, 2015

Barbara Newman
Regulatory Division
New England District, Corps of Engineers
696 Virginia Road
Concord, Massachusetts 01742-2751

Dear Ms. Newman:

This document transmits the U.S. Fish and Wildlife Service's (Service) Biological Opinion (Opinion) addressing the U.S. Army Corps of Engineers (Corps) General Permit for fill associated with the reconstruction of the Stiles Road Bridge, spanning Muddy Brook in Suffield, Connecticut. At issue are the effects on federally listed endangered dwarf wedgemussels (*Alasmidonta heterodon*), located within the vicinity of the Stiles Road Bridge. This Opinion is prepared in accordance with section 7 of the Endangered Species Act of 1973 (ESA), as amended (16 U.S.C. 1531 et seq.).

Our Opinion is based on information provided in your October 20, 2014 letter requesting initiation of formal consultation and project design plans and documents submitted by Mr. Joshua Wilson of Fuss and O'Neill on behalf of the permit applicant. Our Opinion is also based on letters, telephone conversations and electronic communications with your agency, the Connecticut Department of Energy and Environmental Protection (CT DEEP), and staff from Fuss & O'Neill. A complete administrative record of this consultation is on file at this office.

I. CONSULTATION HISTORY

See Appendix I.

II. BIOLOGICAL OPINION

Description of the Proposed Action

The Federal action being evaluated in this Opinion is the bridge rehabilitation work described in the application for a Corps Section 404 General Permit (Fuss & O'Neill 2014; B. Newman, Corps, electronic transmission, dated February 3, 2015) and the Biological Assessment for

Formal Section 7 Consultation: Effects of the Stiles Road Bridge Repair Project on the Dwarf Wedgemussel (Muddy Brook; Suffield, Connecticut) (BA) (Biodrawversity LLC 2014a). The proposed repairs to the Stiles Road Bridge will result in approximately 728 square feet (ft^2) (67.6 square meters[m^2]) of wetland impacts (permanent and temporary fill) and 996 ft^2 (92.5 m^2) of impacts to the riverbanks of Muddy Brook in Suffield, Connecticut. A detailed project description, including plans for the Bridge repair, is described in the Corps application and the BA. A summary of the proposed project follows.

The Stiles Road Bridge spanning Muddy Brook is a steel multi-stringer single-span structure supporting a concrete deck that provides access to buildings owned by Suffield Academy. In recent years, erosion and scour have impacted the Bridge, increasing the likelihood that the Bridge will not be able to withstand high water events and increased erosion of the streambank. Repairs and modifications required to ensure the Bridge provides safe access over Muddy Brook will include patching areas of poorly consolidated concrete on the Bridge and reconstruction of the southwest wingwall. Erosion control and bank stabilization measures will be implemented within an area 18 ft (5.5 m) upstream and 18 ft (5.5 m) downstream of the Bridge. Construction activities are anticipated to take approximately six weeks.

Project-specific construction activities related to bridge repair and erosion control include:

- excavation and placement of concrete wingwall extensions to reconstruct the southwest wingwall;
- removal of damaged and undermined asphalt behind the northwest wingwall and placement of fill in the eroded areas behind the wingwall;
- placement of pre-cast concrete blocks at other existing wingwall locations;
- removal of vegetation within 5 ft of any bridge component;
- re-grading of the areas along the northeast, northwest and southwest wingwalls at a two horizontal to one vertical slope;
- re-grading, riprap and revegetation of embankments for a minimum of 18 ft (5.5 m) upstream and 18 ft (5.5 m) downstream of the Bridge at a two horizontal to one vertical slope;
- minor bridge rehabilitation construction, including removal and patching of poorly consolidated concrete on the substructure and underside of the bridge deck, cleaning and sealing of joints between the Bridge and roadway, and waterproofing the surface of the bridge deck;
- installation of a temporary cofferdam parallel to the riverbank and adjacent to the bridge abutments; and
- installation of a temporary turbidity curtain downstream of the work area and extending from bank to bank.

<u>Action area</u>

The action area includes an approximately 425-foot (130 m) stretch of Muddy Brook in which direct and indirect adverse effects may occur. The action area begins approximately 330 ft (100 m) downriver of the Stiles Road Bridge and ends 85 ft (26 m) upriver of the Bridge. The action area includes all regulated wetlands addressed under the proposed Section 404 permit. According to the BA, the action area will include instream areas where temporary erosion control devices and permanent fill will be placed and areas within and downstream of the project area where effects of possible sedimentation and short-term changes in flow may occur. The action area also includes the area to which dwarf wedgemussels will be relocated prior to the onset of construction activities. Approximately 1,451 ft^2 (134.8 m^2) within Muddy Brook will be permanently or temporarily affected, not all of which is anticipated to be suitable habitat for dwarf wedgemussels.

Conservation measures to reduce impacts to dwarf wedgemussels

The project incorporates a number of conservation measures that will avoid and minimize adverse effects to dwarf wedgemussels present in the project action area. Instream and riverbank construction activities will not occur between April 1 and May 31, considered to be the peak of spring spawning for dwarf wedgemussels in Massachusetts and most likely in Connecticut (McLain and Ross 2005). Standard construction Best Management Practices (BMPs) outlined in the BA will be implemented to further reduce or avoid adverse effects to dwarf wedgemussels.

Conservation measures that will be implemented to prevent stockpiled material from seeping or leaching into Muddy Brook and causing sedimentation include the following:

- material will be staged and/or stockpiled in a paved parking lot approximately 300 ft (91 m) east of Muddy Brook;
- a double row of silt fencing and hay bales will contain stockpiled material; and
- stockpiled material will be covered at the end of the day or when not in use.

Conservation measures that will be implemented to prevent the possibility of contaminants from construction equipment entering Muddy Brook include the following:

- a site engineer will approve locations of on-site maintenance and refueling of construction equipment; these locations will be at least 150 ft (45 m) from wetlands or watercourses and at a location where drainage is adequately protected with secondary containment;
- absorbent material will be placed on the ground prior to refueling to catch any spills that may occur;
- all material placed on the ground will be removed and disposed of;
- all material will be removed upon completion of the construction;
- no construction equipment will enter Muddy Brook;
- a spill prevention plan will be in place; and
- the contractor will have a spill cleanup kit capable of removing contaminants from Muddy Brook (should there be an accidental spill).

Erosion control measures that will be implemented to avoid and minimize adverse impacts to the water quality of Muddy Brook in the vicinity of dwarf wedgemussels include:

- temporary bank stabilization utilizing erosion control blankets;

- unvegetated areas that remain exposed after September 15 will be stabilized with hay bale check dams, filter fabric or wood chip mulch;
- prior to beginning fill activities, establishment of an erosion control line (hay bale check or filter fabric) approximately 10 ft (3 m) from the toe of the slope of proposed fill areas; and
- stabilization of filled slopes will be initiated within 30 days of the start of fill activities.

Preconstruction mussel relocation will be implemented to reduce the number of dwarf wedgemussels that may be taken as a result of excavation, fill or release of sediment into Muddy Brook. A complete description of the mussel relocation protocols is found on pages 4 and 5 of the BA.

The Corps has proposed to include a number of permit conditions to further avoid and minimize adverse effects to dwarf wedgemussels present in the action area. Many of these conditions have been included in the project description provided by the project permit applicant. The following conditions will minimize the potential of erosion, sedimentation and contamination of Muddy Brook:

- construction shall take place during low flow periods;
- no instream or riverbank work shall occur from April 1 to May 31 in any year for which work has started;
- an erosion control line shall be established approximately 10 ft (3 m) from the toe of the slope of proposed fill areas prior to construction;
- stabilization of filled slopes must be initiated within 30 days of the start of fill activities;
- rolled erosion control materials (netting or filter fabric) must be limited to 100 percent natural non-plastic and biodegradable materials;
- construction equipment may not enter Muddy Brook;
- stone riprap material must be inspected prior to installation and washed if necessary to prevent sediments from entering Muddy Brook;
- revegetation using native shrub and/or tree species will be required for at least 200 ft (61 m) of riverbank downstream of the Bridge for a width of 20 ft (6.1 m) from the top of the slope landward;
- no spraying of glycophosphate (e.g., glyphosate) shall occur within the project impact area as well as the upriver and downriver dwarf wedgemussel relocation areas; and
- relocated dwarf wedgemussels will be checked within one month, and one year following relocation to monitor mortality, movement and growth.

STATUS OF THE SPECIES

The Service listed the dwarf wedgemussel as endangered on March 14, 1990 (55 FR 9447-9451). The following is a summary of dwarf wedgemussel general life history drawn from the dwarf wedgemussel recovery plan (USFWS 1993), the 2007 five-year review for the dwarf wedgemussel (USFWS 2007), and the 2013 five-year review (USFWS 2014), unless otherwise stated.

The dwarf wedgemussel is found solely in Atlantic Coast drainage streams and rivers of various sizes and moderate current. It ranges from New Hampshire to North Carolina, in small creeks to deep rivers in stable habitat with substrates ranging from mixed sand, pebble and gravel, to clay and silty sand. In the southern portion of its range, it is often found buried under logs or root mats in shallow water, whereas in the northern portion of its range, it may be found in firm substrates of mixed sand, gravel or cobble, or embedded in clay banks in water depths of a few inches to greater than 20 ft (6.1 m). The dwarf wedgemussel is not a long-lived species as compared to other freshwater mussels; life expectancy is estimated at 10 to 12 years (Michaelson and Neves 1995).

The reproductive cycle is typical of other freshwater mussels, requiring a host fish on which its larvae (glochidia) parasitize and metamorphose into juvenile mussels. Since the release of the 1993 Recovery Plan, a number of fish species have been positively identified as hosts for the dwarf wedgemussel. Michaelson and Neves (1995) confirmed the tessellated darter (*Etheostoma olmstedi*), Johnny darter (*E. nigrum*), and mottled sculpin (*Cottus bairdi*) as host fish for dwarf wedgemussel in the southern part of its range. Wicklow (in the New Hampshire Wildlife Action Plan 2006) confirmed the slimy sculpin (*C. congatus*) and Atlantic salmon juveniles and parr (*Salmo salar*) as possible host fish for dwarf wedgemussel in New Hampshire. The shield darter (*Percina peltata*), striped bass (*Morone saxitilis*), banded killifish (*Fundulus diaphanus*) and brown trout (*Salmo trutta*) were also identified as hosts for dwarf wedgemussel of the Delaware River watershed (White 2007). White (2007) also observed significant differences in the rate of host fish infestation by dwarf wedgemussel glochidia taken from three different major river basins.

The dwarf wedgemussel is considered to be a long-term brooder. In general, dwarf wedgemussel glochidia may be released between March and June, with peak release times varying from south to north. Michaelson and Neves (1995) documented the reproductive cycle of the dwarf wedgemussel from North Carolina and observed that dwarf wedgemussel spawn in late summer, become gravid in September, and release glochidia in April. Wicklow (in New Hampshire Wildlife Action Plan 2006) observed glochidia release beginning in March and continuing through June in the Ashuelot River in New Hampshire. In a study of dwarf wedgemussel reproduction in the Mill River, Massachusetts, McLain and Ross (2005) observed that most glochidia were released in April and May.

Reproductive output appears to be correlated with local population abundance. McLain and Ross (2005) documented that sites with the highest abundance of adult dwarf wedgemussel also demonstrated the highest proportion of gravid females, glochidial density, fish host infection, and density of juvenile mussels.

Human activity has significantly degraded dwarf wedgemussel habitat, causing a general decline in populations and a reduction in distribution of the species. Primary factors responsible for the decline of the dwarf wedgemussel include: 1) impoundment of river systems; 2) pollution; 3) alteration of riverbanks; and 4) siltation.

Damming and channelization of rivers throughout the dwarf wedgemussel's range have resulted in the elimination of much of its formerly-occupied habitat. In general, dams and river channelization activities result in the loss or alteration of mussel habitat (Watters 2001). Immediately upstream of a dam, conditions such as heavy silt deposition, low current and low oxygen levels are not conducive to the maintenance of dwarf wedgemussel populations. Immediately downstream of these dams, remaining habitat is subject to daily water level and temperature fluctuations and scour, conditions stressful or intolerable to sensitive and relatively thin-shelled dwarf wedgemussels. The majority of viable dwarf wedgemussel populations occur in river systems fragmented by dams, including the Ashuelot River (NH), Connecticut River (NH/VT), Mill River (MA), Farmington River (CT), Podunk River (CT), Neversink River (NY), Paulins Kill River (NJ), and the Tar River (NC).

Domestic and industrial pollution was the primary cause for mussel extirpation at many historic sites. Mussels are known to be sensitive to a wide variety of heavy metals and pesticides, and to excessive nutrients and chlorine (Havlik and Marking 1987). Mussel die-offs have been attributed to chemical spills, agricultural waste run-off, ammonia and low dissolved oxygen levels. In one instance in August of 2001, more than 20 dwarf wedgemussels and hundreds of other mussel species (including state-listed species) were killed in the Connecticut River watershed by waste run-off from a small farm.

Some pollutants indirectly impact the mussels; for example, nitrogen and phosphorus cause organic enrichment, and in extreme cases, oxygen depletion. Recent research on the effects of total suspended solids (TSS) indicates that elevated levels of TSS (organic or inorganic) could interfere with the fertilization of eggs by either decreasing the chance that females encounter suspended sperm, or sperm are bound to mucus and egested (Gascho Landis *et al.* 2013).

Riverbank alteration includes bank erosion control measures, such as riprap, and removal of vegetation, particularly shade trees and bushes. Placement of unwashed riprap along the bank will result in increased sedimentation in the water column, while placement of stones in the river will bury mussel beds and habitat. Removal of shade trees and bushes in small stream systems may lead to significant daily water temperature fluctuations and alter light levels, potentially affecting both the mussels and host fish species. These detrimental activities have been observed on numerous occasions within the Connecticut River watershed and include riparian vegetation removal along a golf course on the Ashuelot River, riverbank stabilization on the main stem of the Connecticut River (permitted and illegal), and removal of riparian vegetation, streambank stabilization and construction of a weir on the Mill River in Massachusetts.

Siltation, generated by road construction, agriculture, forestry activities, and removal of streambank vegetation, is considered to be an important factor in the decline of many freshwater mussel species, including the dwarf wedgemussel. Sediment loads in rivers and streams during periods of high discharge may be abrasive to mollusk shells. Erosion of the outer shell allows acids to reach and corrode underlying shell layers (Harman 1974). Irritation and clogging of gills and other feeding structures in mussels occur when suspended sediments are siphoned from the water column (Loar *et al.* 1980), severely affecting the mussel's normal activity or even causing death.

Because freshwater mussels are relatively sedentary and cannot move quickly or for long distances, they cannot easily escape when silt is deposited over their habitat. Ellis (1936) found that mussels could not survive in substrate on which silt accumulated to depths over 0.6-2.5 cm. He observed dying mussels with large quantities of silt in their gills and mantle cavities and attributed their deaths to interference with feeding and to suffocation. In addition, Ellis determined that siltation from soil erosion reduced light penetration, altered heat exchange in the water, and allowed organic and toxic substances to be carried to the bottom where they were retained for long periods of time. This resulted in further oxygen depletion and possible absorption of these toxicants by mussels (Harman 1974).

A further probable adverse effect on many mussel species is the impact of sedimentation or pollution on host fish species. Some fish species are vulnerable to changes in light, turbidity and pollutants. Any water quality degradation that affects the host fish species may affect dwarf wedgemussels.

Most of the dwarf wedgemussel populations are small and geographically isolated from each other. This isolation restricts exchange of genetic material among populations, and reduces genetic variability within populations. Strayer (1994) conducted a rangewide assessment of the dwarf wedgemussel, examining thirteen rivers and streams from New Hampshire to North Carolina. Strayer concluded that all 13 populations of the dwarf wedgemussel, including the population in the lower Connecticut River, are vulnerable to loss because of their small range, low population densities, linear ranges, or some combination of the three factors. However, for all but one of the populations studied, densities determined by Strayer were large enough so that he did not expect them to be affected by problems such as inbreeding or demographic stochasticity. Even though there was evidence of reproduction at most sites, Strayer felt that these populations demonstrated lower fertilization rates than other freshwater mussel species.

More recently, surveys for dwarf wedgemussels were conducted at 210 locations over an approximately 120-mile stretch of the Connecticut River in New Hampshire and Vermont in preparation for the relicensing of several hydroelectric dams. Some of these sites had been investigated by Strayer (1994) during his rangewide assessment surveys. Surveys included one 17-mile free-flowing stretch and three impounded stretches (Biodrawversity *et al.* 2014). Dwarf wedgemussels were not found in the free-flowing stretch of the Connecticut River, although transect surveys as recently as 2001 documented dwarf wedgemussels at or near three of the sites surveyed in 2013. This same stretch of River was considered by Strayer (1994) to be less vulnerable to inbreeding or demographic stochasticity. However, given the recent findings that dwarf wedgemussels may be absent or in extremely low numbers in the free-flowing stretch of the Connecticut River that separates existing occurrences in the impounded areas behind the hydroelectric dams, it is possible that the genetic diversity of the remaining Connecticut River occurrences will ultimately be diminished as well. It is not known why dwarf wedgemussels have apparently disappeared from this portion of the Connecticut River.

The dwarf wedgemussel requires stable river systems (Nedeau 2008), and the deleterious effects of floods and droughts have already been witnessed in the Neversink River (NY) and Upper Tar River (NC) populations, respectively. Flooding may affect dwarf wedgemussel populations through the disruption of reproduction or by mussels getting swept downriver into areas of less or non-suitable habitat. Surveys in 2006 indicated that the dwarf wedgemussel population in the Neversink River was adversely affected by flood events, although some live mussels were detected (Campbell *et al.* 2006; Campbell *et al.* 2007). The 17-mile stretch of free-flowing Connecticut River between the Wilder and Bellows Falls dams was severely affected by Hurricane Irene in 2011. The lack of dwarf wedgemussels encountered during subsequent surveys of sites previously thought to have stable populations could have been caused by the River's extreme high flows and velocity removing mussels or altering their habitat to make it unsuitable (Biodrawversity LLC *et al.* 2014).

Drought or manipulated water flows resulting in abnormally low water levels also appear to have adverse effects on dwarf wedgemussel populations. Galbraith *et al.* (2015 in press) investigated the response of several freshwater mussel species to experimental dewatering and observed that most species became stranded under low and moderate rates of dewatering and all individuals were stranded under rapid dewatering. This was evident in the Upper Tar River watershed in North Carolina, where severe population declines have been documented following a substantial drought in 2007 (USFWS 2014). Although mussels have evolved to respond to natural low water events, severe droughts or dewatering resulting from anthropogenic causes (e.g., dam removals, reconstruction or inspections, or construction activity occurring within occupied mussel habitat) may result in desiccation of mussels on or in the substrate, increased rates of predation, loss of productivity, or change in the fish species composition, including host fish.

Although northern streams and rivers normally have spring freshets (high water caused by melting snow and ice), it appears that unusually high water events in late spring, early summer and fall may be on the increase, possibly caused by climate change. It is likely that changes in precipitation patterns will bring about more extreme and more frequent flood and drought events (Karl *et al.* 2009). Milly *et al.* (2005) predict that runoff will increase from 10 to 40 percent in rivers of eastern North America, and Najjar *et al.* (2000) also predict increases in streamflow in mid-Atlantic coastal streams. Droughts will be more common in the southern portion of the dwarf wedgemussel's range, particularly in North Carolina (Karl *et al.* 2009). Given this, it is reasonable to conclude that climate change will have a negative impact on the dwarf wedgemussel. Moreover, increasing water temperatures are likely to alter or restrict the ranges of coldwater fish species (Eaton and Scheller 1996), many of which serve as hosts for larval mussels.

Five non-jeopardy formal consultations have been completed for projects within the Connecticut River watershed since 1996 (Table 1). Most of the consultations were with the Corps for activities permitted or carried out by that agency. The most recent consultation was an intra-service consultation (within the Service) on a dam removal on the Ashuelot River. Multi-year post-construction surveys were conducted for all four Corps' projects. The relocation surveys did not document localized population declines and estimated that only a small number of relocated dwarf wedgemussels may have died as a result of the relocation. The estimated relocated mussel mortality rates were lower than had been reported elsewhere in the literature (Cope and Waller 1995; Dunn *et al.* 2000; Kitchel 1995). The fish passage project on the Mill River in Massachusetts anticipated very low numbers of dwarf wedgemussels could be incidentally taken as a result of the removal of culverts. However, long-term beneficial effects were anticipated due to enhanced fish passage, including host fish and improved River flows.

Table 1. Previous biological opinions completed for dwarf wedgemussels in the Connecticut River watershed in New Hampshire, Massachusetts and Vermont.

Year	Waterbody	Project	Incidental Take		Project Completed
			Amount/Extent of Take	Documented	
1996	Connecticut River	Bank stabilization (VT)	0.6 acre of habitat, 7 percent of relocated mussels, unknown number of mussels not relocated would be lost under riprap.	Seven-year study indicated high rate of survival of over 500 relocated mussels. Estimated mortality much lower than anticipated incidental take.	Yes
2002	Ashuelot River	Flood control (NH)	Take in the form of harassment and possible loss of productivity.	No mortality or decline in productivity or local population documented during post-construction surveys through 2009.	Yes
2003	Connecticut River	Bank stabilization (NH)	14,700-square-foot loss of habitat, relocation of a minimum of 50 dwarf wedgemussels with expected mortality of 3 percent to 7 percent, unknown number of mussels lost beneath riprap, most likely more than relocated.	Twenty mussels relocated upriver, all mussels found in post-construction survey. No mortality due to relocation. Estimated mortality lower than anticipated incidental take.	Yes
2006	Mill River	Fish passage (MA)	Less than five mussels anticipated to be relocated with no mortality anticipated. Unknown number of mussels equal to or less than those relocated may be lost due to construction activity.	No mussels found, therefore none relocated; a few mussels may have been lost due to construction. River flow and fish passage restored, long-term beneficial effects anticipated.	Yes
2009	Ashuelot River	Dam removal (NH)	Take of approximately 50 individuals was anticipated based on the low numbers of dwarf wedgemussels encountered during pre-construction surveys. Take was anticipated in the form of direct killing, temporary loss of occupied, suitable habitat, and harm to physical disturbance through relocation, siltation, and short-term water quality degradation.	496 dwarf wedgemussels were relocated prior to and after the dam removal, far more than was anticipated. Post-construction surveys have not been completed.	Yes

Rangewide Status and Recovery Objective

At one time, this species was recorded from 70 localities in 15 major drainages ranging from North Carolina to New Brunswick, Canada. Since the 1993 Recovery Plan, a number of new locations have been discovered and a number of known locations are possibly no longer extant.

Based on preliminary information, the dwarf wedgemussel is currently found in 15 major drainages (Table 2). It is not possible to assess the number of "sites" because of the lack of a clear definition for "site." This is due in part to the discovery of large, contiguous stretches of river hosting scattered occurrences of dwarf wedgemussels that function as one "population," such as in the main stem of the Connecticut River in New Hampshire. However; specific sites or stretches of the Connecticut River identified in the Recovery Plan as critical to recovery and essential for maintaining viable populations no longer coincide with new location information.

Table 2. Dwarf wedgemussel major drainages.[1]

State	Major Drainage	County
NH	Upper Connecticut River	Coos, Grafton, Sullivan, Cheshire
VT	Upper Connecticut River	Essex, Orange, Windsor, Windham
MA	Middle Connecticut River	Hampshire, Hampden
CT	Lower Connecticut River	Hartford
NY	Middle Delaware	Orange, Sullivan, Delaware
NJ	Middle Delaware	Warren, Sussex
PA	Upper Delaware River	Wayne
MD	Choptank River	Queen Anne's, Caroline
MD	Lower Potomac River	St. Mary's, Charles
MD	Upper Chesapeake Bay	Queen Anne's
VA	Middle Potomac River	Stafford
VA	York River	Louisa, Spotsylvania
VA	Chowan River	Sussex, Nottoway, Lunenburg
NC	Upper Tar River	Granville, Vance, Franklin, Nash
NC	Fishing Creek	Warren, Franklin, Halifax
NC	Contentnea Creek	Wilson, Nash
NC	Upper Neuse River	Johnson, Wake, Orange

The main stem of the Connecticut River in New Hampshire and Vermont is considered to have the largest remaining dwarf wedgemussel population, consisting of three distinct stretches of sporadically occupied habitat segmented by hydroelectric dams. The Ashuelot River in New Hampshire, the Farmington River in Connecticut (both within the Connecticut River basin), and the Neversink River in New York (Delaware River basin) are also considered to harbor viable populations. Because of qualitative survey methods used to assess the populations, it is not feasible to estimate the number of individuals in these populations (USFWS 2014). However, recent surveys indicate that in some locations in these rivers, dwarf wedgemussel subpopulations may be declining. Nedeau documented significant declines at long-term survey locations on the Ashuelot River between 2004 and 2012 (E. Nedeau, electronic transmittal, October 6, 2014). During surveys conducted for the relicensing of several dams on the Connecticut River, no dwarf wedgemussels were located in the 17-mile free-flowing stretch between the Wilder Dam and the Bellows Fall Dam impoundments (the southernmost population of dwarf wedgemussels on the Connecticut River), whereas historically, a number of sites had consistently supported dwarf wedgemussels (Strayer 1994; Gabriel 1996; Biodrawversity *et al.* 2014).

[1] The 15 major drainages identified in Table 2 do not necessarily correspond to the original drainages identified in the 1993 Recovery Plan, although there is considerable overlap. Watersheds are based on USGS and EPA Cataloguing Units; see http://water.usgs.gov/GIS/huc_name.html and http://cfpub.epa.gov/surf/locate/index.cfm (accessed February 2015).

The remaining populations from New Jersey south to North Carolina are estimated at a few individuals to a few hundred individuals. It appears that the populations in North Carolina, Virginia, and Maryland are declining, as evidenced by low densities, lack of reproduction, or the inability to relocate any dwarf wedgemussel in follow-up surveys.

In order to reclassify the dwarf wedgemussel as threatened from endangered, the following populations must be shown to be viable (a population containing a sufficient number of reproducing adults to maintain genetic variability, and annual recruitment is adequate to maintain a stable population) (USFWS 1993):

- Main stem Connecticut River (NH/VT)
- Ashuelot River (NH)
- Neversink River (NY)
- Upper Tar River (NC)
- Little River (NC)
- Swift Creek (NC)
- Turkey Creek (NC)
- Six other rivers/creeks representative of the species' range

In order to remove the dwarf wedgemussel from the Federal list of threatened and endangered species, the following criteria must be met:

1. At least 10 of the rivers/creeks in the preceding criterion must support a widely dispersed viable population so that a single catastrophic event in a given river will be unlikely to result in the total loss of that river's population.
2. The rivers should be distributed throughout the species' current range with at least two in New England (New Hampshire, Vermont, Massachusetts, Connecticut), one in New York, and four south of Pennsylvania.
3. All populations referred to in the criterion to down list the species to threatened and the preceding two criteria must be protected from present and foreseeable anthropogenic and natural threats that could interfere with their survival.

The Service's five-year status reviews for the dwarf wedgemussel (USFWS 2007; 2014) noted that few recovery criteria have been met, and moreover, some of the criteria need revision. Since the Recovery Plan was released in 1993, the definition of "site" or "occurrence" is no longer clear. Some of the confusion is due to the discovery of large, contiguous stretches of river hosting scattered occurrences of dwarf wedgemussels that function as one "population" such as in the main stem of the Connecticut River in New Hampshire. Moreover, specific sites or stretches of river identified in the Recovery Plan as critical to recovery and essential for maintaining viable populations do not coincide with current location information.

ENVIRONMENTAL BASELINE

The proposed Bridge replacement will occur in Muddy Brook, a tributary to Stony Brook located within the Connecticut River watershed in northern Connecticut. Small scattered occurrences of dwarf wedgemussels are limited to a stretch of Muddy Brook that is completely located in the town of Suffield, Connecticut. During a pre-construction survey, seven dwarf wedgemussels were found within approximately 330 ft (110 m) of the project area, including two downstream from the subject Bridge (but not within the area of direct impacts) and five upstream of the Bridge. An additional five dwarf wedgemussels were located farther upstream at the potential relocation sites (Biodrawversity 2014a). A new occurrence was recently documented in Muddy Brook upriver of the project area (Biodrawversity 2014b). Twenty-six live dwarf wedgemussels were observed during that survey, apparently the highest number of animals documented at one location in Muddy Brook. Both Muddy Brook surveys were qualitative and not intended to estimate the local population. Nevertheless, the number of animals encountered during the surveys would indicate a small and most likely viable population in Muddy Brook.

Dwarf wedgemussels were recently rediscovered in Stony Brook, also in Suffield, Connecticut (Biodrawversity 2014b). Given the limited distance between Stony Brook and Muddy Brook (approximately 3 river miles), there is the possibility that there may be genetic exchange between the two small populations in these streams. Dwarf wedgemussels are not known to occur in the vicinity of the confluences of Stony and Muddy Brook, or the confluence of Stony Brook and the Connecticut River. The only known populations of dwarf wedgemussels in the Connecticut River occur much farther north in sections of the River in central and northern New Hampshire and Vermont. Therefore, there is little possibility for genetic exchange between the main stem Connecticut River populations and the Muddy Brook population.

Factors Affecting the Species within the Action Area

The action area is limited in size, consisting of a 425-foot (130 m) stretch of Muddy Brook, encompassing adjacent upland areas proposed for bank stabilization and for staging construction material and equipment. The total amount of fill within the action area is less than 0.5 acre (0.2 hectare) in size. Upland bank stabilization will occur approximately 18 ft (5.5 m) above and below the Bridge on either side of Muddy Brook and will extend approximately 16 ft inland from the toe of the riverbank. Approximately 1,451 ft^2 (134.8 m^2) of stream substrate will be temporarily or permanently filled, although not all of this area is considered to be suitable dwarf wedgemussel habitat.

Because of the small size of the action area, there are few, if any, factors that may be affecting the dwarf wedgemussels in the action area. There have been no formal or informal consultations under section 7 within the action area and there are no Federal actions proposed or ongoing that may benefit the species. There is no State, Tribal, local or private action ongoing or occurring contemporaneously with this consultation process. The Bridge, road and adjacent lands are under private ownership. Adjacent upland consists primarily of a forested buffer between Muddy Brook to the southeast, a few residential structures to the west and northeast, and forested to the west and north. Potential road run-off might affect Muddy Brook water quality if road salt is applied during the winter. Run-off from fertilizers or herbicides that are applied to the nearby athletic fields could also affect water quality if entering Muddy Brook.

Effects of the Action

In evaluating the effects of the Federal action under consideration in this consultation, 50 CFR 402.2 and 402.14(g)(3) requires the Service to evaluate the direct and indirect effects of the proposed action on the species.

The BA (pages 6-7) provides a detailed discussion on the direct and indirect adverse effects and beneficial effects of the Bridge reconstruction and bank stabilization on dwarf wedgemussels occurring within the action area.

Direct adverse effects occur on the species or its habitat as a direct result of the project. Direct adverse effects will occur from: 1) the placement of stone fill on mussels and their habitat for the bank stabilization; 2) marking and moving mussels during the mussel relocation phase of the project; 3) sedimentation during construction activities; and 4) dewatering occupied mussel habitat behind the cofferdam. Some of the direct adverse effects will occur as a result of burying, crushing and/or injuring mussels during placement of the stone fill, since not all mussels may be found and moved prior to construction, the permanent destruction of 1,451 ft^2 (134.8 m^2) of suitable dwarf wedgemussel habitat in Muddy Brook (if we assume the entire area to be filled is suitable habitat), and mortality of non-relocated mussels occurring within the dewatered work zone behind the cofferdam. Other direct adverse effects may include suffocation and feeding inhibition of mussels caused by increased sedimentation from the bank stabilization construction, and stress from the handling, marking and moving of mussels that may result in short-term reduced productivity and growth, or death of adults and/or juveniles.

Impacts to dwarf wedgemussels will be avoided or minimized by limiting the time of year during which instream construction occurs, employing erosion control measures to significantly reduce or avoid siltation in Muddy Brook, and relocating individuals to a suitable, safer location from areas designated to receive stone fill or identified as being dewatered during the Bridge reconstruction and bank stabilization. These minimization measures have been incorporated into the project proposal (see pages 17-18 of this Opinion).

Indirect effects are defined as effects not immediately caused by the proposed action, but still reasonably certain to occur (50 CFR 402.02). Indirect effects to adult and larval mussels may result from rain events both during and after construction (before vegetation has been established on disturbed ground) that could cause increased sedimentation, and during and after the removal of the temporary cofferdam that might increase turbidity. These indirect adverse effects are anticipated to be short term, occurring during construction or post-construction until vegetation has been re-established.

The effects of the action under consultation are also analyzed together with the effects of other activities that are interrelated to, or interdependent with, that action. An interrelated activity is an activity that is part of the proposed action and depends on the proposed action for justification. An interdependent activity is an activity that has no independent utility apart from the action under consultation. The Service does not anticipate any interrelated or interdependent effects.

Beneficial effects are anticipated to occur as a result of the regrading and revegetation of the streambank and reconstruction of the bridge wingwall to prevent the continuation of existing bank erosion and scour near the Bridge. Reducing the potential for scour and erosion, as well as the prevention of a catastrophic failure of the Bridge under an extreme high water event, will prevent additional sedimentation from affecting mussel habitat in the future. We anticipate that the elimination of the existing bank erosion will improve water quality and maintain or enhance dwarf wedgemussel habitat within the vicinity of the project area.

Cumulative Effects

Cumulative effects include the effects of future State, local or private actions that are reasonably certain to occur in the action area considered in this Opinion. Future Federal actions that are unrelated to the proposed action are not considered in this section because they require separate consultation pursuant to section 7 of the ESA. The Service is not aware of any future state, local or private actions that could occur within the action area that would not be subject to a section 7 review. Therefore, cumulative effects, as defined in the ESA, are not expected to occur within the action area and will not be addressed further in this Opinion.

CONCLUSION

After reviewing the current status of the dwarf wedgemussel in the Muddy Brook watershed and throughout its range, the environmental baseline for the action area, the effects of the proposed actions, including beneficial effects, and the cumulative effects, it is the Service's opinion that the Stiles Road Bridge reconstruction and bank stabilization in Suffield, Connecticut is not likely to jeopardize the continued existence of the dwarf wedgemussel. Important factors include conservation measures outlined in the project description that would reduce the extent of take, including the time-of-year restriction to avoid affecting glochideal release by female dwarf wedgemussels and glochidial attachment to host fish, the relocation of mussels out of the construction areas, measures to reduce or avoid sedimentation, and planting streamside vegetation to maintain a shaded, vegetative buffer between the athletic field and Muddy Brook. No critical habitat has been designated for this species; therefore, none will be affected.

This non-jeopardy determination is based on the limited duration of adverse effects to suitable habitat not permanently altered, the very small amount of suitable habitat that will be permanently eliminated, the very small and localized population of dwarf wedgemussels that may be harmed or killed, and the anticipated high survival rate of relocated mussels that will continue to ensure genetic exchange within the Muddy Brook subpopulation. Based on survey results, the subpopulation of dwarf wedgemussels at the Stiles Road Bridge is a small portion of the overall population of dwarf wedgemussels in Muddy Brook. No dwarf wedgemussels were documented in the area that will be permanently or temporarily filled; therefore, it is anticipated that only very low numbers may be subject to mortality from dewatering or fill. All individuals were previously located upriver or downriver of the project area. The project is not anticipated to occur during peak glochidia release; therefore, impacts to productivity should be limited to loss of juveniles and adults not found during pre-construction surveys. The possible loss of a very limited number of individuals is not expected to significantly affect genetic diversity or long-term productivity of the Muddy Brook population. Conservation measures included in the project proposal should also insure that the species will not be jeopardized.

III. INCIDENTAL TAKE STATEMENT

Section 9 of the ESA and Federal regulations pursuant to section 4(d) of the ESA prohibit the take of threatened or endangered species respectively, without a special exemption. Take is defined as to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture or collect, or attempt to engage in any such conduct. Harm is defined by the Service as an act that actually kills or injures wildlife, and is further defined as significant habitat modification or degradation that results in death or injury to listed species by significantly impairing behavioral patterns such as breeding, feeding, or sheltering. Harass is defined by the Service as intentional or negligent actions that create the likelihood of injury to listed species to such an extent as to significantly disrupt normal behavior patterns which include, but are not limited to, breeding, feeding or sheltering. Incidental take is defined as take that is incidental to, and not the purpose of, the carrying out of an otherwise lawful activity conducted by the Federal agency or the applicant. Under the terms of section 7(b)(4) and section 7(o)(2), taking that is incidental to and not intended as part of the agency action is not considered a prohibited taking, provided that such taking is in compliance with the terms and conditions of this Incidental Take Statement.

Amount or Extent of Incidental Take Anticipated

The Service anticipates that incidental take of dwarf wedgemussels throughout the action area will be difficult to detect. Current monitoring methodology generally does not give precise population counts, and detecting a significant change in the population may take years or decades. A significant percentage of the dwarf wedgemussel population within the action area may occur below the surface of the substrate at any given time, precluding exact mussel counts. Although spent shells may be collected, attributing the cause of mortality may be difficult. Juvenile mussels are extremely difficult to detect, therefore it is impossible to document take of this life stage.

The Service anticipates that incidental take of the dwarf wedgemussel is likely to occur during construction in the form of direct killing of an unknown but very small number of individuals (those that are not moved out of the construction area), permanent loss of 1,451 ft^2 (134.8 m^2) of occupied, suitable habitat and harm to an unknown number of individuals due to physical disturbance through relocation, siltation, and short-term water quality degradation.

Relocation of dwarf wedgemussels is expected to avoid direct mortality of some mussels from the construction and fill activities and dewatering of the construction area. However, incidental take in the form of some level of mortality of relocated mussels is expected. Cope and Waller (1995) conducted a literature review of mussel relocations and evaluated the relative success of this technique as a conservation and management strategy. They determined a mean mortality of 49 percent of relocated mussels, based on an average recovery rate of 43 percent. Most of the relocation experiments that we reviewed involved marking mussels and moving them to a more distant location, requiring the containment of mussels for a period of time outside of the river, and translocation of mussels between sites in coolers. Dunn *et al.* (2000) reviewed a number of relocation studies, and conducted studies to determine factors important to successful mussel relocation efforts. They determined that the success in relocating freshwater mussels was dependent on a number of factors, including the time of year, stress to mussels from handling and transport, and the substrate into which the mussels were moved, and they observed mortality ranging from 0 to 11.8 percent.

H. E. Kitchel (1995) attempted to assess the effectiveness of mussel relocation by marking and moving mussels to an adjacent area, and compared survival rates to mussels marked but not moved (as a control to isolate the effect of marking alone). An average of approximately 7 percent of the total percent of individuals recovered was from marked spent shells, suggesting high survival. In addition, it was determined that moving mussels did not significantly appear to reduce or arrest growth.

In 1997, 536 dwarf wedgemussels (87 marked) were relocated out of an area impacted by a bank stabilization project in Lunenburg, Vermont to a refuge 1,600 feet (500 m) upriver of the project area. The relocation site was monitored for three consecutive years. Gloria and Wicklow (2001) documented 11 live marked mussels in 1998 (13 percent), 17 live marked mussels in 1999 (20 percent), and 27 live marked mussels in 2000 (31 percent). Only one marked dead mussel was found in 2000 (3 percent mortality).. A number of marked animals were found more than one time. The number of unmarked mussels in the relocation site remained relatively consistent, indicating that mortality resulting from the relocation may have been insignificant. A final survey was conducted in 2004 (Nedeau 2004a), seven years after project completion and mussel relocation. Survey results indicated that the dwarf wedgemussel numbers in the relocation area remained stable or had increased (1,441 mussels were documented in the area where 536 animals had been relocated in 1997). Moreover, ten dwarf wedgemussels tagged in 1997 were observed within the relocation area (11 percent).

Based on these studies, it is likely that the majority of relocated dwarf wedgemussels will survive. However, it is not known if productivity will be affected in the short term, as a result of unsuccessful fertilization in the fall or lack of development and release of glochidia after the first year following the project's completion.

During the pre-construction survey of the project area, including the potential relocation site, a total of 12 dwarf wedgemussels were located. No dwarf wedgemussels were observed in the area to be affected by permanent or temporary fill. We anticipate that at a minimum, 10-12 dwarf wedgemussels may be relocated to the upstream site. If suitable habitat exists within the area directly impacted by fill, we anticipate a very small number of dwarf wedgemussels not found prior to construction will be killed by crushing or desiccation from installation of the cofferdam and placement of stone fill and dewatering. Estimates of the number of mussels buried in the substrate versus those on the surface vary widely and may be species specific or biased by sex of the species (Smith *et al.* 2001; Strayer and Smith 2003). Nedeau (2004b, 2006) found that dwarf wedgemussels found during excavation were a small fraction (7 percent) of the total number of dwarf wedgemussels encountered during quantitative surveys of two occurrences on the Ashuelot River in New Hampshire. However, Smith *et al.* (2001) documented different detection rates for subsurface mussels versus surfacial mussels ranging from 31 percent for *Pleurobema clava*, 52 percent for *Epioblasma torulosa rangiana* to more than 70 percent for *Actinonaias* *ligamentina.* We could conservatively estimate that at least an additional 50 percent of the number of dwarf wedgemussels found at the surface could be buried in the substrate and unavailable for relocation. These mussels would be killed as a result of the temporary and permanent fill.

In summary, we anticipate take in the form of mortality of a small number of dwarf wedgemussels not encountered during the pre-construction relocation effort will occur within the area receiving temporary and permanent fill. Take in the form of harassment may also occur should relocation interrupt the reproductive cycle of relocated dwarf wedgemussels. We do not anticipate take from sedimentation or release of TSS, given the conservation measures addressing erosion control.

Effect of the Take

The Service has determined that the level of anticipated take is not likely to result in jeopardy to the dwarf wedgemussel.

Reasonable and Prudent Measures

Reasonable and prudent measures are measures considered necessary or appropriate to minimize the amount or extent of anticipated incidental take of the species. Reasonable and prudent measures, along with the terms and conditions that implement them, cannot alter the basic design, location, scope, duration, or limit of the action, and may involve only minor changes.

The Service believes the following reasonable and prudent measures are necessary and appropriate to further minimize impacts of incidental take of dwarf wedgemussels:

1. Siltation or contamination of the water column of Muddy Brook must be avoided or minimized to the maximum extent feasible to avoid stress or death of dwarf wedgemussels.
2. The number of dwarf wedgemussels that may be buried under stone fill or exposed to desiccation must be minimized to the maximum extent possible.

Terms and Conditions

In order to be exempt from the prohibitions of section 9 of the ESA, the Service and contractors must comply with the following non-discretionary terms and conditions, which implement the reasonable and prudent measures described above. The terms and conditions associated with the reasonable and prudent measures articulated in this Opinion will minimize the level of incidental take identified for the dwarf wedgemussel.

1. Siltation and/or contamination control measures:

    a. Ensure that all conservation measures described in the project proposal summarized on pages 3-4 of this Opinion are implemented.
    b. No instream or riverbank work shall occur from April 1 to May 31.

c. Construction vehicles will not be stored, serviced, washed or flushed in a location where leaks, spills, waste materials or cleaners will be introduced into wetlands or watercourses.
d. Maintenance or refueling of equipment and vehicles will occur at least 150 ft from wetlands or watercourses at a location where drainage is directed away from the River.
e. Absorbent material will be placed on the ground prior to refueling to catch spills that may occur, and will be removed after construction is completed.
f. The contractor will have a spill cleanup kit capable of removing contaminants from Muddy Brook (should there be an accidental spill) on site and at all times.
g. Stabilization of slopes in fill areas shall commence within 30 days of the initiation of fill activities.
h. Silt fencing and/or hay bales that contain stockpiled material will be maintained during construction and removed immediately after project is complete.

2. Minimization of burial or desiccation of dwarf wedgemussels

   a. Pre-construction survey and relocation for the area near the Bridge - During low-flow conditions within two weeks prior to construction, qualified biologist(s) using SCUBA and/or snorkel gear will survey, collect and relocate dwarf wedgemussels from areas 100 m downstream of the Bridge, at the Bridge, and 30 m upstream of the Bridge. This work will be done during optimal conditions for finding dwarf wedgemussels. Mussels will be moved to suitable habitat as demonstrated by the presence of dwarf wedgemussels. The relocation site will be upstream of the Bridge in an area not directly or indirectly affected by the project.
   b. One-year post-construction survey - The relocation site must be surveyed within one year post-construction to monitor mussel mortality, movement and/or growth.

Reporting and Monitoring Requirements

A report summarizing the Bridge reconstruction project must be provided to the Service (see contact information below) within six months of the project's completion. The report should include at a minimum: 1) construction start and finish dates; 2) documentation of unusual storm events occurring during the construction, and efforts implemented to minimize adverse effects resulting from storm events; and 3) summary of the revegetation effort (species, numbers of plants, photo of revegetation site).

Separate reports regarding the relocation of dwarf wedgemussels should also be submitted to the Service (see contact information below). An interim report should be submitted within three months of the initial relocation effort and three months after the one-year follow-up survey. The reports should include at a minimum: 1) the number of mussels moved/encountered; 2) the length of individuals; 3) tag numbers; 4) photographs of individual mussels; 5) summary and photo of relocation site habitat; 6) latitude/longitude of the relocation site; 7) copies of data sheets; and 8) unusual observations (if any).

All necessary permits for collecting dwarf wedgemussel shells and conducting mussel monitoring must be obtained. If freshly-killed dwarf wedgemussels are found in the project area, care must be taken in their handling to preserve biological material in the best possible condition. In conjunction with the preservation of any dead specimens, the finder has the responsibility to ensure that evidence intrinsic to determining the cause of death of the specimen is not unnecessarily disturbed. The finding of dead specimens does not imply enforcement proceedings pursuant to the ESA. The reporting of dead specimens is required to enable the Service to determine if incidental take is reached or exceeded and to ensure that the terms and conditions are appropriate and effective. Upon locating a dead, injured, or sick specimen of an endangered or threatened species, prompt notification must be made to:

Thomas R. Chapman, Supervisor
New England Field Office
U.S. Fish and Wildlife Service
70 Commercial St., Suite 300
Concord, NH 03301
(603) 223-2541

Reinitiation Notice

This concludes formal consultation on the Federal action outlined in the October 20, 2014 initiation letter. As provided in 50 CFR 402.16, reinitiation of formal consultation is required where discretionary Federal agency involvement or control over the action has been maintained (or is authorized by law) and if 1) the amount or extent of incidental take is exceeded; 2) new information reveals effects of the agency action that may affect listed species or critical habitat in a manner or to an extent not considered in this Opinion; 3) the agency action is subsequently modified in a manner that causes an effect to the listed species or critical habitat that was not considered in this Opinion; or 4) a new species is listed or critical habitat designated that may be affected by the action. In instances where the amount or extent of incidental take is exceeded, all activities that are causing such take must cease until such time as any necessary consultation is completed in order to avoid violation of section 9 of the ESA.

The Service appreciates the opportunity to work with the Corps in fulfilling our mutual responsibilities under the ESA. Thank you for your cooperation, and please contact Ms. Susi von Oettingen at (603) 223-2541, extension 22, if you need further assistance.

Sincerely yours,

Thomas R. Chapman
Supervisor
New England Field Office

cc: Reading file
Laura Saucier, CTDEEP via email
Jenny Dickson, CTDEEP via email
Sandra Doran, NYFO via email
Linda Brunza, CTDEEP via email (Linda.Brunza@ct.gov)
ES: SvonOettingen:3-6-15:603-223-2541

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APPENDIX I

CONSULTATION HISTORY

October 22, 2012 – CT DEEP Wildlife electronically transmitted their letter, dated October 19, 2012, providing preliminary comments on the Stiles Road Bridge replacement project.

April 24, 2013 – NEFO notified by Biodrawversity that Alasmidonta heterodon was located within the Stiles Road Bridge replacement project action area.

January 20, 2014 – Electronic transmittal by Fuss & O'Neill providing Muddy Brook survey report documenting presence of Alasmidonta heterodon within the project action area.

January 31, 2014 – CT DEEP Wildlife electronic transmittal of Stiles Road Bridge replacement project application Request for Natural Diversity Data Base (NDDB) State Listed Species Review to CT DEEP Wildlife.

January 31, 2014 – Telephone conference call between Fuss & O'Neill, CT DEEP Wildlife, and NEFO discussing process for consulting under section 7 of the ESA.

March 7, 2014 – Corps provided electronic copies of the Service's Information, Planning, and Conservation System (IPaC) results for the Stiles Road Bridge replacement project and requests informal consultation.

March 10, 2014 – Copy of Section 404 Individual Permit Application to the Corps, dated February 4, 2014, was received by NEFO.

March 12, 2014 – NEFO provided components of a formal section 7 consultation package for the Stiles Road Bridge replacement project to the Corps and Fuss & O'Neill.

March 12, 2014 – The Corps forwarded additional information needed to review Stiles Road Bridge replacement project for potential adverse effects to Alasmidonta heterodon.

April 21, 2014 – Biological Assessment sent by Fuss & O'Neill, dated April 16, 2014, was received by NEFO.

May 7, 2014 – Corps electronic transmission to NEFO clarifying effects of the proposed Stiles Road Bridge replacement project.

May 21, 2014 – NEFO provided recommendations to reduce adverse effects from the construction activity associated with the Stiles Road Bridge replacement project on Alasmidonta heterodon and requested additional information on the project to Fuss & O'Neill.

September 17, 2014 – Fuss & O'Neill electronically transmitted letter to NEFO providing additional information and addressing conservation measures that will reduce adverse effects to Alasmidonta heterodon.

September 29, 2014 – Series of electronic transmissions refining bank stabilization conservation measures to reflect CT DEEP Water Protection and Land Use recommendations between NEFO, Fuss & O'Neill, and CT DEEP Wildlife and CT DEEP Water Protection and Land Use.

October 1, 2014 – Electronic transmittal from Fuss & O'Neill confirming use of biodegradable erosion control matting in accordance with CT DEEP Water Protection and Land Use recommendation.

October 20, 2014 – Corps requested initiation of formal section 7 consultation for the Stiles Road Bridge replacement project. Corps letter received by NEFO on October 23, 2014.

November 7, 2014 - NEFO letter to the Corps acknowledging receipt of initiation request.

December 22 – 23, 2014 - Electronic correspondence between NEFO and Fuss & O'Neill regarding review of draft project description.

January 28, 2015 - Electronic correspondence between NEFO and the Corps providing clarification regarding a proposed permit condition.